CALIFORNIA SPOTTED OWL (*Strix occidenatlis occidentalis*)

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Criteria Scores

Population Trend	Range Trend	Population Size	Range Size	Endemism	Population Concentration	Threats
5	0	7.5	5	10	0	10

Special Concern Priority

Included on both Remsen's (1978) original list, as a second priority species, and CDFG's (1992) more recent unprioritized list.

Breeding Bird Survey Statistics

Data inadequate for trend assessment at the subspecies level (Sauer et al. 2000).

General Range and Abundance

There are three recognized subspecies of spotted owls. The northern spotted owl, *S. o. caurina*, occurs in the coastal mountain inland to the eastern slopes of the Coast Range and Cascades from San Francisco north into southwestern British Columbia (Thomas et al. 1990). The Mexican subspecies, *S. o. lucida*, occurs from southern Utah and Colorado south into Mexico to Jalisco and Michoacan (USDI Fish and Wildlife Service 1995).

The California subspecies is found in the Sierra Nevada from the Pit River south through the Greenhorn Mountains, along the south coast range and Transverse Ranges of California, from Monterey County to southern San Diego County (Verner, Gutiérrez and Gould 1992).

Seasonal Status in California

The California spotted owl is a resident species. Its breeding season is from mid-February through August, depending upon the latitude and elevation of occurrence. However, some spotted owls in the Central Sierra Nevada show down-slope migration in the winter (Laymon

1989, Verner et al. 1991).

Historical Range and Abundance in California

Grinnell and Miller (1944) described three separate populations of the spotted owl in California. The northern spotted owl's range was given as the Coast and Klamath ranges from Marin County to the Oregon border and east to the Sacramento River north of what is now Lake Shasta.

The California spotted owl's range was depicted as extending the along the west slope of the Sierra Nevada, from south of Mt. Lassen to Kings Canyon National Park. Reported observations, from north to south, came from Mineral in Tehama County, a site in Placer County, Calaveras Big Trees, Yosemite, and Redwood Mountain, Tulare County.

Grinnell and Miller (1944) noted a separate population in the Transverse Ranges from near Santa Barbara south and east to Palomar Mountain in northern San Diego County. Many of the observations in this area, especially in the San Gabriel Mountains, were at the lower elevations of the mountain ranges, near the Pacific Ocean at Oceanside, and along the Santa Ana River in northeastern Riverside County. They mentioned questionable evidence of the owl's existence in San Luis Obispo County; while they agreed that the owls may occur in this area, they did not show the range extending north beyond southeastern Santa Barbara County.

Recent Range and Abundance in California

Range. The current distribution and abundance has been verified by numerous observations in both the Sierra Nevada and south coastal California since 1973 (CDFG Spotted Owl Database 2002). Although it is similar to that described by Grinnell and Miller, in having a Sierra Nevada and a south coast population, the owl is now known to occur in all counties in the Sierra Nevada except Inyo County. On the north the California spotted owl's range meets the northern subspecies at the Pit River. On the south owl sites occur through the Greenhorn Mountains and

on Piute Mountain. There are some known sites east of the Sierra Nevada crest, especially in pockets of mixed conifer forest. However, they are generally uncommon and the sites are often outliers.

The distribution of the California spotted owl in the Sierra Nevada can be uniform and regular on a local basis where suitable habitat exists. However, suitable habitat is not evenly distributed and currently has a potential to become even more fragmented (Beck and Gould 1992). Gaps, both naturally occurring and man-made, have been identified in the Sierra Nevada. These gaps and bottlenecks in the owl's distribution may lead to further fragmentation of the population in the future and limit dispersal or reduce the ability of one population to demographically support an adjacent population. These areas of concern have the potential to reduce the general north to south dispersal of owls along the west face of the Sierra Nevada (Beck and Gould 1992).

The owl's range along the south coast of California also is more widespread than reported by Grinnell and Miller (1944). Current records show owl sites in the Coast Range from Carmel south to Orange and San Diego Counties (to within 12 miles of the border with Mexico) and in the Transverse Ranges from Santa Barbara County east to western San Bernardino and Riverside Counties.

However, these owls are not distributed in a contiguous range as presented by Grinnell and Miller (1944). There are no less than 11 populations containing from 2 to 125 known sites (Beck and Gould 1992). In southern California the effect of natural gaps between areas of suitable habitat is a greater problem than in the Sierra Nevada. The human occupancy in this region will further isolate populations, reduce the size of existing populations, and lead to a much higher rate of loss of populations due to stochastic occurrences. LaHaye et al. (2001)

studied dispersal between populations in southern California as a part of demographic studies in the San Bernardino Mountains, where almost 100% of the individuals were marked. No birds marked in the San Bernardino Mountains have been found in either the eastern San Garbriel Mountains or the San Jacinto Mountain area, the locations of the closest populations. Also, no owls marked in the San Jacinto Mountain area were found in the San Bernardino Mountains. Urban, desert, and other arid areas in southern California appear to be a formidable barrier to dispersing California spotted owls

Abundance. Since 1973, there have been 26,850 observations of territorial spotted owls at what are believed to be 2,179 separate locations (CDFG Spotted Owl Database 2002). This dramatic increase in the number of known sites over the last 58 years represents organized surveying efforts that were non-existent prior to the 1970's. The number of new sites continues to grow, though the much reduced rate in the last seven years indicates that most sites with currently suitable habitat have been located .

CDFG's Spotted Owl Database (2002) recognizes 1,745 spotted owl activity centers in the Sierra Nevada and 434 in southern California. Most owls are found on the west slope of the Sierra Nevada. Approximately 82 % of the owl sites in the Sierra Nevada are in mixed conifer forest with lesser numbers in red fir forests and ponderosa pine/hardwood forests. The major populations in southern California are in the San Bernardino Mountains, southern Santa Barbara and Ventura counties, San Gabriel Mountains, Monterey County, and San Diego County. There are less that ten known sites in the Santa Ana Mountains, Tehachapi Mountains, or the Tecuya Mountain area.

Population size varies over time and across the species' range and cannot be easily interpreted from the number of known territorial sites. In some areas over 40% of the known

sites have been vacant at any one time and this rate changes with time. As many as 35% of occupied sites may be occupied only by single individuals. Not all spotted owls, particularly dispersing juvenile and subadult owls, are territorial and occupy sites; these owls generally cannot be counted nor calculated. Given 1,745 California spotted owl activity centers, an occupancy rate of known sites from three study areas in the Sierra Nevada of about 75%, and about 85% of the occupied sites with pairs (the remainder with single individuals), the estimated territorial population in the Sierra Nevada could be roughly estimated at 2,400 individuals. Using the 434 California spotted owl activity centers known in the south coastal range and applying information from the San Bernardino study (a territory occupancy rate of about 52% and pairs occupying about 88% of the known occupied sites) provides a roughly estimated population of 425 territorial owls in this part of the species' range.

Trends in Abundance, Sierra Nevada. There are four ongoing demographic research studies in Lassen, El Dorado, Fresno, and Tulare counties in the Sierra Nevada. Two of the four studies are on managed forest lands on national forests. Another is on managed national forest lands intermixed (checkerboarded) with private commercial forest lands. The fourth study is on national park lands. Additionally, there have been radio-telemetry studies of spotted owls in Lassen, Sierra, and Fresno counties.

Information from the demographic studies indicates that spotted owls are declining (USDI Fish and Wildlife Service 2000). Blakesley et al. (2001) reported a calculated finite rate of population change (Lambda = ?) of 0.910, or a decline of 9% per year over the period from 1990 to 1999 on the Lassen County study area. Calculations of Lambda for the El Dorado study area in the central Sierra Nevada estimate a 5.2%, per year, reduction in population from 1990 through 1999 (Seamans et al. 2001).

The calculated finite rate of population change on managed lands of the southern Sierra National Forest study area (SNF) between 1987 and 2000, suggested an annual rate of decline of 10% to11% while the rate of decline for a similar period on the Sequoia National Park study area (SNP) was 3% (Steger et al. 2000). The difference in Lambda between the SNP and the SNF appears to be in higher survivorship of adults in the National Park.

Calculations of Lambda are most sensitive to adult female survival but year-to-year variations in fecundity controls the standard deviation. Higher amounts of core habitat lead to higher survival (Franklin et al. 2000) and this may be the reason that the rate of decline is not as great in SNP as in SNF. Also, calculations of Lambda may not reflect the true rates of decline, usually due to uncertainty in accounting for immigration and emigration (Raphael et al. 1996, Verner 1999) and of juvenile survival rates (Noon et al. 1992).

Three of the four demographic study areas also have bounded study areas where all sites are surveyed and the number of owls and occupied sites in the study area is determined annually. This allows some analysis to determine if there is an observed loss of individuals and occupied sites over time. Owl abundance declined from 69-85 owls present in 1990 and 1991 to 55-56 in 1999 and 2000 in the Sierra National Forest study area (Steger et al. 2000). In 2000, owls were found at 28 of 48 historic territories on the Eldorado study area (Gutiérrez et al. 2000). The number of owls in the Sequoia National Park study area was more stable with 60 owls located in 1991 and 1992 and 58-64 found in 1999 and 2000. In all cases, populations of owls were highest from 1993 through 1995, the result of an abnormally high production of young owls in 1993.

Both the calculated finite rate of population change on all four study areas and the number of owls present on the study areas in both study areas on managed forest lands where this information was available, indicates a population decline. The specific causes of the

changes in population size are unknown. Possible causes may be long-term changes in suitable habitat quantity and quality, variations in weather, and cyclic changes in prey abundance.

Trends in Abundance, Southern California -. There has been only one demographic study in southern California. It was conducted in the largest subpopulation of about 150 known sites and does not well represent areas where owl sites may be widely dispersed and in greater risk of local extinctions if populations decline.

The estimated intrinsic rate of population change of the females in the San Bernardino study area was calculated as an annual decrease of about 13% over the period of 1988 to 1998 (Gutiérrez et al. 1999). In 1998 only 56% of the known sites were occupied. In 2001, known territories in San Jacinto and Santa Ana Mountains were surveyed (W. LaHaye, pers. comm.). Six of 22 sites were occupied in the San Jacinto Mountains and no owls were present at the three known sites in the Santa Ana Mountains.

Ecological Requirements

Large trees, dense forest canopies, a diverse vertical structure, and trees of varying heights typical of mature and older conifer forests usually characterize forested habitats occupied by spotted owls (Verner et al. 1992). Spotted owls nest in large trees, in cavities and broken tops, or on platform nests built by other birds or mammals. Nest trees generally are large and have some decadence in order to provide nesting structures for a spotted owl. Forest canopy is usually greater than 40% and at most owl roost and nest sites there is greater than 90% canopy closure.

California spotted owls are mostly commonly found in mixed conifer forest found at mid elevations. Fewer are found upslope in the red fir zone and down slope in ponderosa pine/hardwood forest. Some owls have been found in foothill riparian/hardwood habitat, and only a very few in eastside pine. Winter habitat for down slope migrants is in ponderosa

pine/hardwood, gray pine/oak, and foothill riparian/hardwood areas.

In south coastal California, owls commonly occupy live oak/bigcone Douglas-fir, riparian/hardwood, and mixed-conifer habitats. Areas dominated by redwoods are used locally in Monterey County.

Home ranges vary greatly by habitat type and the prey type and density supported by the habitat (Zabel et al. 1992). The average, annual home ranges for individual owls in the Sierra Nevada vary from over 12,000 acres in fir and higher elevation forests in Lassen County, to about 5,700 acres in mixed confer forest in Fresno County and slightly less than 900 acres in foothill riparian/hardwood forests at lower elevations in Fresno County.

Spotted owls seek areas of abundant and predictable presence of prey (Ward 1990). A complex forest structure, including dead and down woody material, appears to provide a more diverse and richer habitat for prey species. The owls hunt from a perch and make short flights to take prey. They particularly seek flying squirrels at elevations higher than mid-elevation mixed conifer forest and woodrats become more important to the most dominant prey at lower elevations (Verner et al. 1992). The abundance and availability of these prey species appears to control whether spotted owls nest and their success in rearing young to fledging. Home ranges of spotted owls dependent on flying squirrels are usually larger than those foraging for woodrats, apparently due to the greater abundance of woodrats where they occur.

Spotted owls are irregular breeders with as many as 90% of the pairs in a study population reproducing in a one year and less than 10% in another. Also, a relatively small proportion of sites (20%) have owls producing the majority (50% to 90%) of young. While climate may play an important role in controlling prey abundance, the larger the amount of edge between suitable and other habitats at a site (an indicator of more suitable prey habitat), the

higher the productivity of the pair (Franklin et al. 2000).

While reproductive success appears tied to prey abundance and availability, sites with large amounts of continuous suitable habitat around the nest site tend to have higher survival rates. Large amounts of suitable habitat provide choices of nest sites, a buffer to harsh weather, and protection from predators. Given the dynamics of spotted owl populations, the survival of adult female spotted owls is the most important characteristic in maintaining the population.

Threats

Habitat loss is the greatest long-term threat to spotted owls. This may be due to the loss of suitable habitat to repeated logging which reduces the age, size and decadence of the trees in the forest as a whole, to fragmentation of suitable habitat which may reduce the quantity of suitable habitat and make dispersal between areas of suitable habitat difficult, or to the catastrophic loss of suitable habitat to large wild fires. In the Sierra Nevada, there are inadequate regulatory mechanisms to manage spotted owl habitat on private timberlands, gaps in owl distribution already exist (Beck and Gould 1992), catastrophic fires are occurring with greater frequency, and urbanization is occurring, in foothill habitats that may reduce winter habitat for owls that migrate down slope during the winter.

Existing urbanization, large catastrophic fires, and fragmented habitat, both naturally occurring and made-caused, already exists across much of the owl's range in southern California. Spotted owls apparently do not easily move between at least some neighboring populations (LaHaye 2001). Such isolated populations are at much higher risk of extinction and prolonged loss due the fact that owls cannot demographically support other populations or re-colonize areas that have lost their owls (Noon and McKelvey 1992). In an area with a high human water demand and about one-third of the known owl sites in riparian corridors, water diversions have

and will cause a loss of owls and habitat.

Management and Research Recommendations

Management should provide for constant creation and maintenance of suitable older seral stage forest stands. Some practices would include:

- provide core and foraging habitat on a regular basis across landscape using currently known sites as a guide.
- mix silvicultural practices to provide long-term forest maintenance of all age and structure classes and of old and very old trees and snags.
- maintain forest structure in the short term without reducing suitable habitat today with the intent of growing more older trees in the future.
- limit the harvesting primarily of large trees.
- manage forest to reduce the chance of catastrophic fire within the guidelines given above.

Management in southern California should protect existing habitats. In at least six of eleven populations in southern California, where populations are small and scattered, land managers should look for opportunities to create more habitat. This may mean limiting water diversion, using silvicultural practices to grow trees, managing excessive fuel buildup to control the loss of habitat to fire, further limiting open fires, and controlling recreation access.

Conduct research to:

- determine if variations in site occupation data correlate with calculations from the population model which estimates the annual rate of population change (Lambda).
- determine the long-term population cycle frequency and what the “typical” highs and lows are.
- obtain density or demographic information from private land other than the El Dorado study.

- identify critical wintering habitat at lower elevations.
- conduct studies to evaluate the cause and effects of management actions.
- identify and publish information already conducted on adaptive management actions on the areas covered by the Quincy Library Group and Kings River Project activities.

Monitoring Needs

- determine if management guidelines are being implemented as directed.
- determine if spotted owl management measures are working.
    - monitoring population trends on an annual basis.
    - monitor status and disturbance of habitat in protected activity centers and core areas.
    - provide adequate pre-project monitoring to determine effects of impact.
    - use adaptive management in both major population areas to determine management efforts.

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